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OEM
SERVICE BULLETIN

#4-82
March 1, 1982

MODELS 294-2, 295-2 & 296-2

AMP-CLAMPS

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To the best of our knowledge and at the time written, the information contained in this Service Bulletin is technically correct and the procedures accurate and adequate to effect the repair and to conduct the performance tests required to assure the unit's compliance with its original advertised specifications.

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NOTE: Tolerances referenced in the calibration information are the original manufacturer's calibration specification which are maintained on new equipment to assure compliance with the unit's advertised specifications. Repairing equipment used in the field in a wide variety of environments (over a period of time) to these specifications may not be practical or necessary because of cost. However, it is essential that the advertised specifications as given in the Operator's Manual be met after repairs are made.

SAFETY INFORMATION

The following markings and symbols are used in our Operator's Manuals, Service Bulletins and on the instruments to call attention to information important to the safe operation and maintenance of the instrument. These are national and international standard markings and are defined here for the benefit of anyone not yet familiar with them.

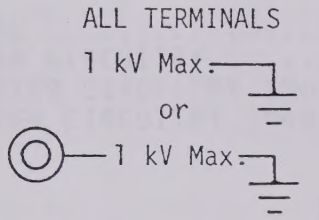
This symbol adjacent to another marking, terminal or operating device indicates that the operator must refer to the instruction manual for further information needed to avoid damage to the equipment and/or possible personal injury.

WARNING

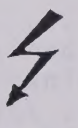
This marking calls attention to an instruction which, if not followed correctly, may result in personal injury and/or damage to the premises.

CAUTION

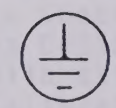
This marking calls attention to an instruction which, if not followed correctly, may result in damage to the instrument



This marking advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage, with respect to earth ground, exceeds (in this case) 1000 V, AC or DC (unless otherwise noted). This voltage is the "maximum rated circuit-to-ground voltage" sometimes referred to as "common-mode" or "floating" voltage.



This symbol adjacent to one or more terminals identifies them as being associated with ranges that may in normal use be subjected to particularly hazardous voltages. For maximum safety, the instrument and its test leads should not be handled when these terminals are energized.



This symbol identifies a "protective" grounding terminal which must be connected to earth ground prior to making any other connections or to applying power to the instrument. In some countries the circle may be omitted.

This symbol represents voltage or current that alternates in polarity (AC).

This symbol represents voltage or current that is in one polarity only (DC).

This symbol represents voltage or current that may be either AC or DC.

This symbol is used to identify an instrument that employs "double-insulation" (IEC Class II) rather than protective grounding (IEC Class I) for protection from electric shock (no connection is made to earth ground).

Read the Operator's Manual and the Service Bulletin carefully and completely. Become thoroughly familiar with the operation, specifications, safety precautions, etc., before operating, calibrating or servicing the Instrument.

Remember that dangerous voltages may appear unexpectedly or in unexpected places in defective equipment. A faulty bleeder resistor, for example, may not discharge a capacitor as intended. Before connecting to or disconnecting from a circuit, make certain that power to the circuit has been turned off and then discharge any and all capacitors and charge retaining devices (a long, unterminated cable, for example, may retain a charge) repeatedly until certain the charge has been dissipated.

Locate all voltage sources and accessibility paths prior to making any measurements or connections.

For your own safety, before each use, inspect the test leads, prods, connectors and power cable for cracks, breaks or crazes in the insulation. If any defects exist, destroy and replace the defective item(s) immediately.

When the instrument must be stored and/or transported in a vehicle in very cold weather, it will be subject to condensation when brought into a warm building. Therefore, do not attempt high voltage measurements until it is certain that the instrument has had time to dry completely.

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PART ONE

GENERAL INFORMATION

GENERAL DESCRIPTION

The Simpson Amp-Clamp Models 294-2, 295-2 and 296-2 are rugged instruments for electrical testing. Capabilities include measurement of AC current up to 300 amperes without disconnecting or breaking into the line being checked. Models 295-2 and 296-2 will also measure line voltages up to 600 V at 60 Hz. Model 296-2 has an additional capability of measuring resistance (0-500Ω).

The accuracy of the Amp-Clamp, with the current-carrying conductor centered between the jaws, is 3% of full scale. (If the conductor is not centered, an additional maximum error of 3% is possible). Voltmeter accuracy is ±3% of full scale at 60Hz. Ohmmeter accuracy is ±3° of arc.

If the line frequency is other than 60Hz, the following additional errors must be considered:

Range	Frequency Range	Max. Additional Error (±%)
6	40 to 1000 Hz	15
All other ranges	40 to 800 Hz	2
	30 to 1000 Hz	3

INCREASING THE AMP-CLAMP SENSITIVITY

Because the Amp-Clamp operates as a transformer with the current-carrying conductor acting as the primary winding, the output of the unit can be doubled, tripled or raised to any desired level by looping the conductor through the jaws more than once. For example, two loops will double the output voltage from the Amp-Clamp while three loops will triple the output. With two loops, each of the six ranges on the Amp-Clamp would provide full scale deflection with half the current. To find the actual current, divide the current value by one-half when using two turns and by one-third when using three turns.

The Model 151 Line Splitter (current transformer) provides a convenient means of increasing the sensitivity of the Amp-Clamp by a factor of 10. Thus a 600 mA current can be measured on the 6 A range.

The voltage ranges of Models 295-2 and 296-2 were selected so that line voltages of 120, 240 and 480 volts can be accurately determined. The 30 volt range is useful for checking thermostat circuits in heating and air conditioning applications.

The resistance range of the Model 296-2 will measure low values of resistance between 0-500 ohms. This low range is useful for checking motors (windings), continuity testing of lines and devices, fuses, switches, etc. Faulty capacitors can generally be tested with this range. leakage or a short will be indicated by a full scale or constant reading.

An additional operating capability in the form of a Pointer Lock Lever makes the Amp-Clamp more versatile. When a measurement is made, the Pointer Lock Lever can be lifted toward the front of the Instrument to lock the pointer to the dial. It thereby provides a mechanical memory system. The pointer is released by moving the lever to the rear.

The Model 296-2 resistance range is fused. A spare fuse is provided in the battery-fuse compartment.

PART TWO

INSTALLATION AND OPERATION

GENERAL

As these are portable instruments no specific installation information is given. Abbreviated operating instructions are given. For detailed instructions see the Operator's Manual (Simpson part no. 6-111126).

Battery Installation (Model 296-2 only) or Replacement

1. Remove the battery fuse compartment cover. Press and slide it toward the terminal side of the case.
2. Remove the contact spring (and battery when applicable).
3. Insert the battery into the compartment with the + end first.
4. Replace the contact spring with the flat side toward the battery.
5. Slide the compartment cover on the case, the serrated end in first.

Fuse Replacement (Model 296-2 only)

1. Remove the battery fuse compartment cover.
2. Remove the open fuse, which is next to the battery compartment. This is the location of the active fuse. The spare fuse is in outer compartment. Use 1/4 A, 8 AG fuse.
3. Insert the fuse into the active fuse compartment.
4. Replace the compartment cover.

Measuring Current

1. Disconnect any test leads from the Amp-Clamp (Models 295-2 and 296-2 only).
2. Set the range selector to the proper current range.
3. Clamp the jaws of the Amp-Clamp around a single current-carrying conductor. The jaws must be completely closed.
4. Read the current value from the appropriate scale.
5. If the pointer cannot be accurately seen, flip the Pointer Lock actuator up.

6. Remove the Amp-Clamp from wire, note reading. Release the pointer lock. Turn the Range Selector to the OFF position.

Measuring AC Voltage (Models 295-2 and 296-2)

1. Connect test leads to the Amp-Clamp. Twist the connectors 1/8 turn to lock them inplace.
2. Set the range selector to the appropriate range.
3. Connect the test leads to the circuit to be measured and apply power.
4. Read the indication.
5. When finished, remove the power and disconnect the test leads. Turn the Range Selector to OFF.

Measuring Resistance (Model 296-2)

1. Connect test leads to the Amp-Clamp.
2. Set the Selector switch to OHMS.
3. Short the test leads and rotate the ohms adjust knob until the pointer indicates zero (full scale). If the pointer cannot be zeroed, replace the battery.
4. Connect the test leads across the resistance being measured. Read the value on the ohms scale.
5. Disconnect the leads when finished and turn the range selector to the OFF position.

PART THREE

THEORY OF OPERATION

GENERAL

The ammeter circuitry operating principle is the same for all three models. The balance of the text applies to the Model 295-2 and 296-2.

No simplified schematics are included, so any references are to the schematics (Figures 6-1, 6-2 and 6-3).

AMMETER CIRCUITRY

The Amp-Clamp ammeter circuitry uses a coil mounted on a split and movable core. In operation, the movable core is clamped around one current-carrying wire supplying the line power. The current-carrying wire then becomes the primary of a transformer with the coil acting as the secondary. The coupling action is performed by the core which must be tightly closed and interleaved for proper operation. The AC current through the wire induces a voltage in the coil which is applied to the full wave rectifier circuit. Potentiometers R5 and R6 provide the calibration for the lower ranges. For operation of the rectifier and meter circuit refer to the paragraph describing the voltmeter circuitry.

If both current carrying wires of a device or line pass through the jaws of the Amp-Clamp, the opposing currents will cancel the field and the Amp-Clamp will not operate.

With the exception of the method of circuit connection, the meter circuitry is typical for AC current measurement.

VOLTMETER CIRCUITRY (MODELS 295-2 AND 296-2)

Conventional circuitry is used to provide the voltmeter function. Test leads are used to connect to the circuit under test.

A typical series type divider network provides the voltage dropping function for the meter circuit. Multiplier resistors R7, R8, R9 and R10 comprise the divider network with taps for 30 V, 150 V, 300 V, and 600 volt ranges. The range selector connects the proper resistor or resistors in the circuit.

A variable resistor (R4) provides the calibration function for all ranges. There is no individual adjustment for the various ranges.

Two diodes are used to provide full-wave rectification with resistors R1 and R2 acting as the load circuit. The meter is in parallel with the load so whatever voltage is across the load is also across the meter. When the line polarity is such that a positive potential is applied to CR1, electrons flow through R2 and CR1, back through R4, R10, R9, R8 and R7 to the opposite side of the line. When the line polarity reverses, electrons flow through CR2 and R1 back to the opposite side of the line. Full scale current is adjusted by R3 and the varistor protects the meter against overloads.

In summary: the measured voltages are reduced by the series dropping resistor(s) R7 through R10, rectified and applied to the meter. Potentiometer R4 is used for calibrating the AC Ranges and potentiometer R3 adjusts the meter current.

OHMMETER CIRCUITRY (MODEL 296-2)

A 1.5 volt battery provides the energy for the typical series type ohmmeter operation. Resistors R1, R11 and R12 make up the series part of the ohmmeter circuit. Resistors R2 and R19 provide the shunt function.

Electron flow from the negative side of the battery proceeds through the fuse and the resistance to be measured, with some of the electron flow going through the shunt resistor R19 and then back to the positive side of B1 through the contacts of the switch. The remaining current divides through the two branches composed of R2 and R1, which has the meter. R11 and R12 limit the current to a safe value. Potentiometer R12 is the Ohms-Adjust control and provides compensation for an aging battery.

Functionally the unknown resistance is placed in series with the battery and the Amp-Clamp meter, which is shunted by a resistor.

When the input leads are shorted, maximum current flows and full-scale (zero ohms) deflection occurs. When the resistor being tested is equal to the shunt resistor value the meter will indicate half scale. Thus, the resistor being tested controls the amount of current in the indicating circuit.

PART FOUR

MAINTENANCE AND REPAIR

GENERAL

Maintenance of the Amp-Clamp is limited to a visual inspection, calibration, and replacement of jaw components if wear is detected. Disassembly procedures are included for repair and replacement purposes.

Equipment Required for Tests and Calibration

1. Variable AC power source (voltage and current) with accuracy of 0.5% or better. Maximum voltage output of 600 V, maximum current of 6 A.

2. Calibrated Model 460 DVOM to monitor voltages or current and to check multiplier resistance values.

3. Resistance decade box.

4. Three Line Splitters (current transformers) 10 turns, 25 turns, 50 turns.

Visual and Mechanical Inspection

1. Remove the housing cover and clean the interior using a clean brush having soft bristles.

2. Inspect the thumbwheel knob scales (range) for abrasion and discoloration that would impair readability. Replace if necessary. It must operate freely with positive detent action.

3. Operate the movable jaw and observe the closing action. The cores should interleave smoothly when a slight rocking motion is used on the handle. The jaws must close completely. Any damage to either interleaving core face will cause incomplete closing and necessitate replacement.

   The jaw tension should be such that when the unit is hung on a wire, or other cylindrical object, the clamping action will retain the Amp-Clamp in the proper position. If clamping tension is inadequate, replace the jaw return spring.

4. Inspect the jaws for cracks, worn areas or other damage that could increase the possibility of shock hazard to the operator. The exposed metal at the jaw tips is normally held away from the test conductor by the conductor diameter and thus is not a problem. If the Lexan covering appears defective, replace the jaw assembly.

5. Inspect the coil exterior for signs of corrosion or deterioration. Replace if questionable.

6. Inspect the circuit board and all electrical components for obvious defects.

7. Inspect the test leads for torn insulation and fatigue cracks. Replace if necessary. Check the connector pins for dirt and corrosion. Clean as required.

8. Check the operation of the Pointer Lock to ensure that the pointer can be clamped over the entire scale. If not, check that the screws securing the scale are tight, also check that the pointer is not bent.

9. Check that the pointer is at zero with Range Selector OFF.

Electrical Tests

1. Place the Amp-Clamp around a test conductor and center the conductor within the Amp-Clamp jaws. The test conductor must have a variable source.

2. Rotate the Amp-Clamp Range Selector to the 6 A position.

3. Turn the power source on to the test conductor. Slowly increase the current in the test conductor to 6 A. The meter pointer should indicate full scale.

4. Turn the power OFF to the test conductor.

5. Rotate the Range Selector to the 15 A position.

6. Turn the power ON to the test conductor. The Amp-Clamp meter should indicate 6 A.

7. Turn the power OFF to the test conductor.

8. Rotate the Range Selector to 30 A position and repeat steps 6 and 7.

9. Check 60 A, 150 A and 300 A ranges by using a line splitter to increase the Amp-Clamp sensitivity, thereby simulating the higher current ranges.

10. Check full-scale reading on all current ranges, which must be within 2.5% of the full-scale value.

11. Check tracking on the 15 A and 30 A range. Tolerance must be within 2.5% of full-scale value.

12. Connect test leads to the Amp-Clamp (Models 295-2 and 296-2).

13. Remove the battery compartment cover and check the battery spring (Model 296-2 only). Apply a light coat of lubricant to prevent corrosion. Insert the spring and replace the cover.

14. Turn the Range Selector to the OHMS position (Model 296-2 only). Short test leads together and rotate the ohms adjust knob for full-scale (zero ohms) reading.

15. Connect a 25 ohm fixed resistor across the test leads.

16. Check reading, it must be 25 ohms ±one minor division.

17. Disconnect the 25 ohm resistor and sequentially connect a 50 ohm and 500 ohm resistor. Check reading. Disconnect the test leads and set the range switch to the 30 V position (Models 295-2 and 296-2).

18. With the test leads connected, sequentially connect probes to calibrated voltages of 30 V, 150 V, 300 V and 600 V (Models 295-2 and 296-2). Check accuracy of scales. Any large scale deviations indicate a change in circuit values or a need for calibration.

Voltmeter Multiplier Checkout (Models 295-2 and 296-2)

The multiplier resistors can be checked without disassembly by using the following procedure:

1. Connect the Amp-Clamp test leads to the test leads of a Model 460 DVOM.

2. Use the DVOM to measure the resistance of the Amp-Clamp multiplier on each voltage range. Check that all ranges exhibit the proper resistance:

Range	Resistance (ohms)
30V	30K
150V	150K
300V	300K
600V	600K

3. This completes the mechanical and electrical tests along with visual inspection.

CALIBRATION PROCEDURES

Meter Balance Check

1. Remove the housing as described in disassembly procedure.

2. Place the Amp-Clamp so that the dial scale is in a vertical position with the pointer in the 9 o'clock position.

3. Rotate the Amp-Clamp 180° so the pointer is in the 3 o'clock position.

4. Rotate the Amp-Clamp 90° so the pointer is in the 12 o'clock position.

5. Rotate the Amp-Clamp 180° so the pointer is in the 6 o'clock position.

6. The pointer should balance within ±1% in these 4 positions. If not, adjust counterweights.

NOTE

Balance must be checked and adjusted before the meter circuits are calibrated.

Meter Circuit Calibration

1. Remove the housing by removing the four screws. Carefully separate the two halves of the housing. Check that the meter is mechanically zeroed. If not, adjust the zero adjusting fork until the meter reads "0".

2. On the Model 294-2, set the Range Selector to any position. On the Model 295-2 or 296-2, set the Range Selector to the blank or OFF position.

3. On the Model 294-2, unsolder and separate the bare wires near the bottom of the Amp-Clamp. The longer (right hand) wire becomes test point "C". The right hand Amp-Clamp terminal on Models 295-2 and 296-2 is terminal "C".

4. Connect an external AC power source to the circuit board (test points "C" and "D") as shown in Figures 4-1 and 5-1, 5-2, or 5-3.

5. Loosen both scale/pointer bumper screws. Remove the screw nearest R3. (See Figure 5-1, 5-2, or 5-3 for location of R3.) The scale can now be moved so R3 is accessible.

6. Apply 261 μA AC to test points "C" and "D". Check meter deflection.

7. If the pointer does not deflect to exactly full scale, carefully move the scale and adjust R3. Return the dial scale to its original position and check for full-scale deflection. Repeat this step if necessary.

8. Replace the scale/pointer bumper screw but do not tighten completely.

9. Connect an AC voltage source (2.5 V, 60 Hz for Model 294-2, or 1.5 V, 60 Hz for Models 295-2 and 296-2) to test points "C" and "D" as shown in Figures 4-2 and 5-1, 5-2, or 5-3. Check for full-scale meter deflection.

10. If exact full-scale deflection is not obtained, remove the other scale/pointer bumper screw. Move the dial aside and adjust R4. Replace the dial to its original position, check for full-scale deflection. Repeat this step if necessary.

11. Replace the scale/pointer bumper screw and tighten both screws securely. Be sure that the pointer bumpers are in the proper locations.

12. Model 294-2 only, reconnect the bare wires separated in Step 3, solder and replace in their original position.

13. Either replace the housing, or proceed with the next calibration procedure.

6 A Range Calibration (50Hz or 60Hz)

1. Remove the housing (if not already removed) by removing the four screws. Carefully separate the two halves of the housing.

2. Rotate the Range Selector to the 6A position.

3. Clamp the jaws of the Amp-Clamp around a test conductor carrying six amperes at 60Hz. Center the test conductor within the Amp-Clamp jaws.

4. 60Hz: Adjust R5 (see Figure 5-1, 5-2, or 5-3) for a full-scale (6 A) reading.

5. 50Hz: With 6A at 60Hz applied, adjust R5 (see Figure 5-1, 5-2, or 5-3) to read 4% lower than the full scale reading of 6A which is 5.76 Amps.

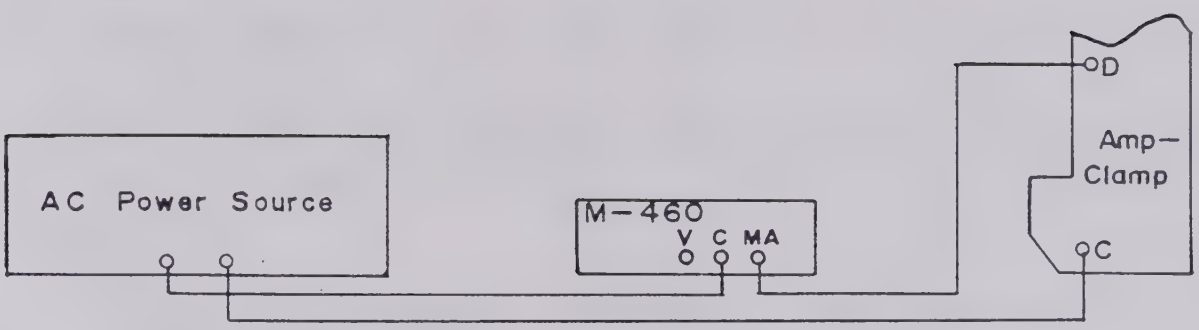

Figure 4 – 1. Meter Calibration

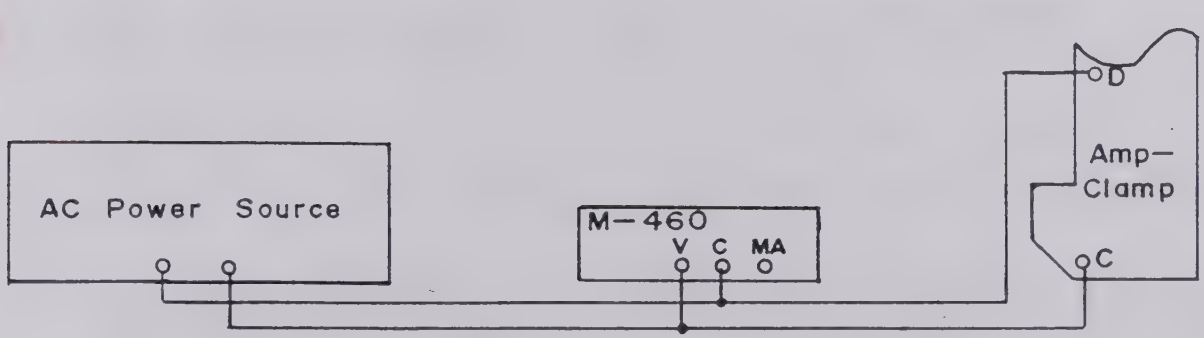

Figure 4 – 2. Voltage Test Setup

15 A Range Calibration (50Hz or 60Hz)

1. Remove housing (if not already removed) as in 6 A Range Calibration.

2. Rotate the Range Selector to the 15 A position.

3. Using the variable AC Power Source, apply exactly 1.5 A at 60Hz to the 10 turn line splitter. Clamp the Amp-Clamp jaws around the line splitter.

4. 60Hz: Adjust R6 (see Figure 5-1, 5-2, or 5-3) for a full scale (15A) reading.

5. 50Hz: With 1.5A at 60Hz applied adjust R6 (see Figure 5-1, 5-2, or 5-3) to read 1% lower than the full scale reading of 1.5A which is 14.85 Amps.

DISASSEMBLY

1. Remove the battery/fuse compartment cover, contact spring and battery (Model 296-2).

2. Remove the four screws that secure the housing assembly and separate the housing.

3. Carefully remove the scale from the meter. The component side of the circuit board is now accessible.

4. For complete disassembly remove the screw that fastens the circuit board to the housing.

5. Unsolder the two meter wires (red and black) from the circuit board, note and mark polarity for replacement purposes.

6. Unsolder the two leads that connect the pickup coil to the circuit board.

7. Carefully slide the circuit board out of the housing without bending the meter pointer. The meter can be removed if necessary (see Meter Movement Removal). The board must be raised over the plastic extrusions on the standoffs before removing.

8. When repairs are completed, reverse these procedures to reassemble the Amp-Clamp.

CAUTION

Do not overtighten the screws. Also check position of the pointer centering adjustor on the housing below the meter before replacing the housing to prevent damage to the pointer adjustor fork.

9. Check pointer zero adjustment when the housing has been reassembled.

Meter Movement Removal

1. Unsolder the meter wires from the circuit board (note polarity).
2. Remove the two hex (scale-screw) studs.
3. Lift the movement out of the assembly.
4. Reverse these procedures during reassembly.

CAUTION

Handle wires carefully so they do not break.

Range Selector Knob Removal

1. Remove the top section of the housing.
2. Remove the circuit board from the housing.
3. Turn the circuit board over with the thumbwheel facing downward.
4. Carefully pry off the self-lock retaining ring that secures the shaft to the switch.
5. Pull the knob and shaft out.
6. Reverse these procedures when replacing the knob.

CAUTION

The shaft can be rotated 180°. Note switch position when removing. Voltmeter range positions can be checked by following voltmeter multiplier resistor check out procedures.

Ohms Adjust Knob Removal

1. Disassemble the housing as instructed.
2. Remove the screw that fastens the knob to the control and lift knob off.

Transformer and Movable Jaw Assembly Removal

WARNING

The jaw return spring is under tension and can be ejected with force unless spring pressure is released.

1. Remove the housing as instructed.

2. Unsolder the two transformer core wires from the circuit board.

3. Release spring tension by moving the spring arm from the jaw assembly and allowing it to rest against the side of the case. Tension at this point is negligible.

4. Remove the large screw holding the movable jaw and remove the jaw.

5. Remove the small retaining screw from the fixed jaw and lift out the jaw assembly.

6. If the transformer core is being replaced, slide it off the fixed jaw and slide the new core on. Make sure that the wires extend from the outside end near the small retaining screw hole.

7. Reverse this procedure for reassembly.

8. During jaw reassembly, hook the spring arm against the movable jaw and move the jaw assembly into place.

Pointer Lock Lever Check and Adjustment

1. Lift Lock Lever Handle to lock the pointer in the zero position. Move the Amp-Clamp to different angles to make sure the pointer remains locked in zero position. Release the Lock Lever.

2. Apply current or voltage to obtain a half-scale reading. Lift Lock Lever handle. Again check that the pointer remains locked to this position at various angles.

3. Repeat step 2 with a full-scale indication. If the pointer remains locked-in at all positions no adjustment is necessary. If not, check that the scale/pointer bumper screws are tight. Bend the pointer toward the dial scale with tweezers if necessary. Do not over-bend. The pointer must move freely in the unlocked position.

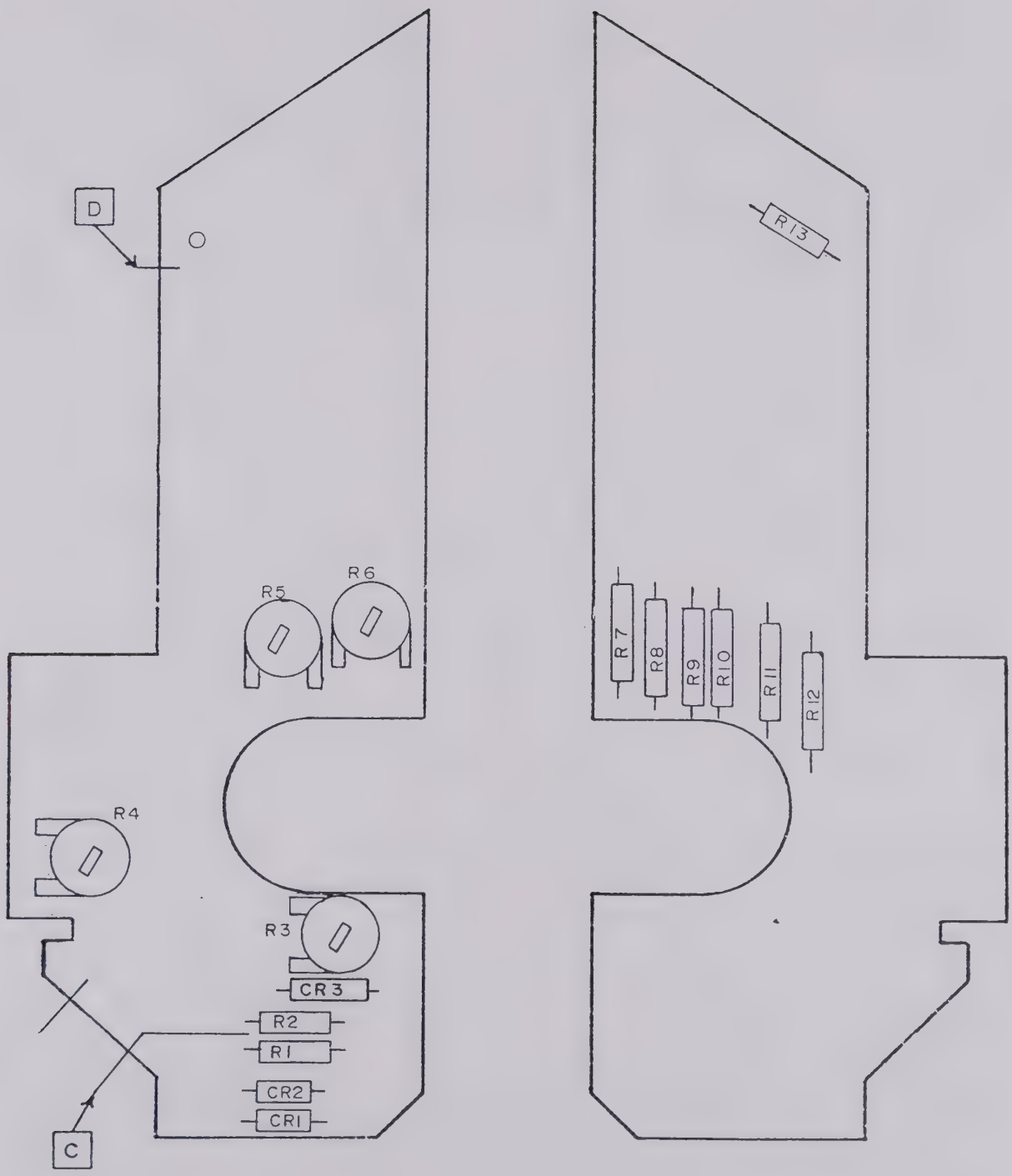

Fig. 5-1. Component Location Diagram, Model 294-2

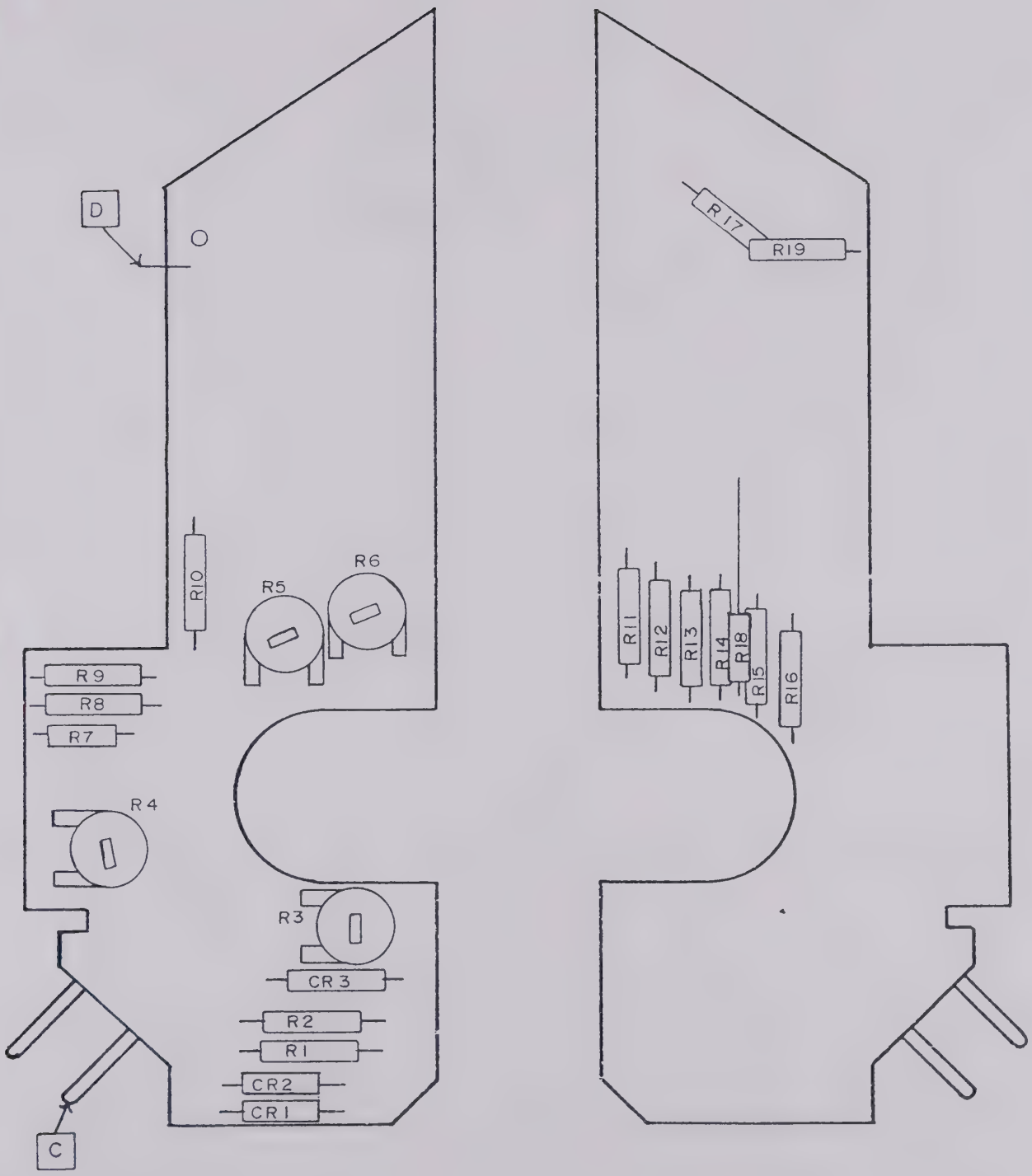

Fig. 5-2. Component Location Diagram, Model 295-2

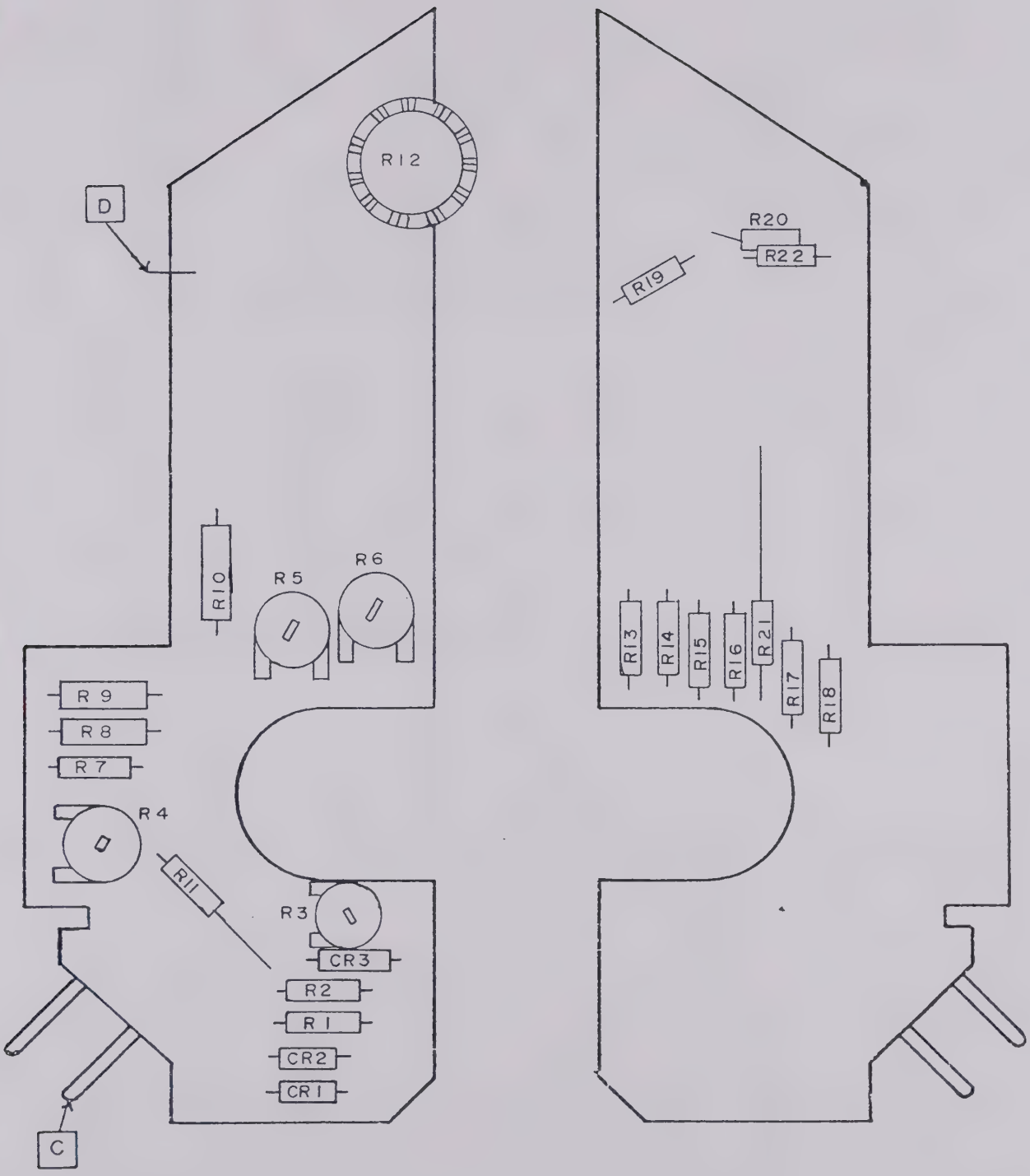

Fig. 5-3. Component Location Diagram, Model 296-2

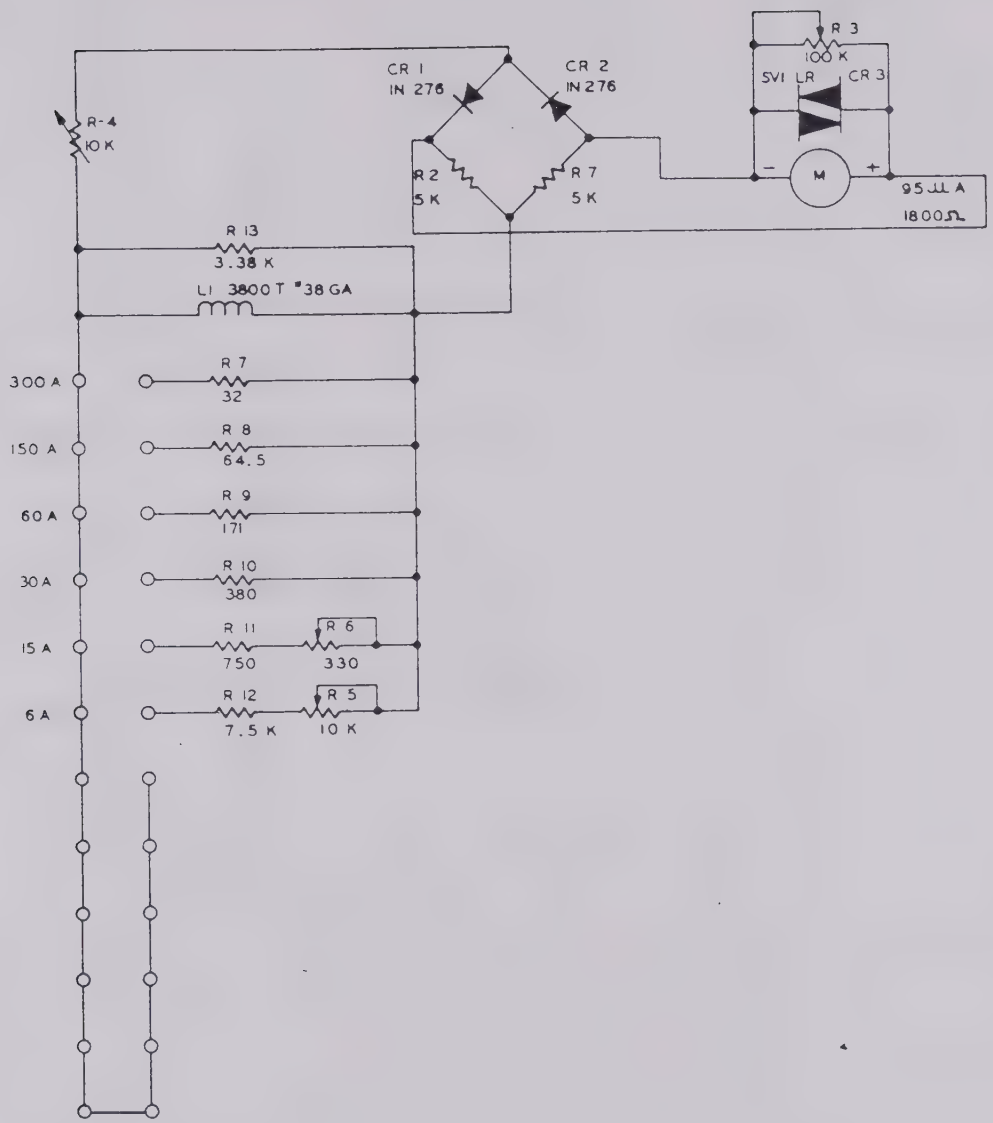

Fig. 5-4 Schematic Diagram, Model 294-2

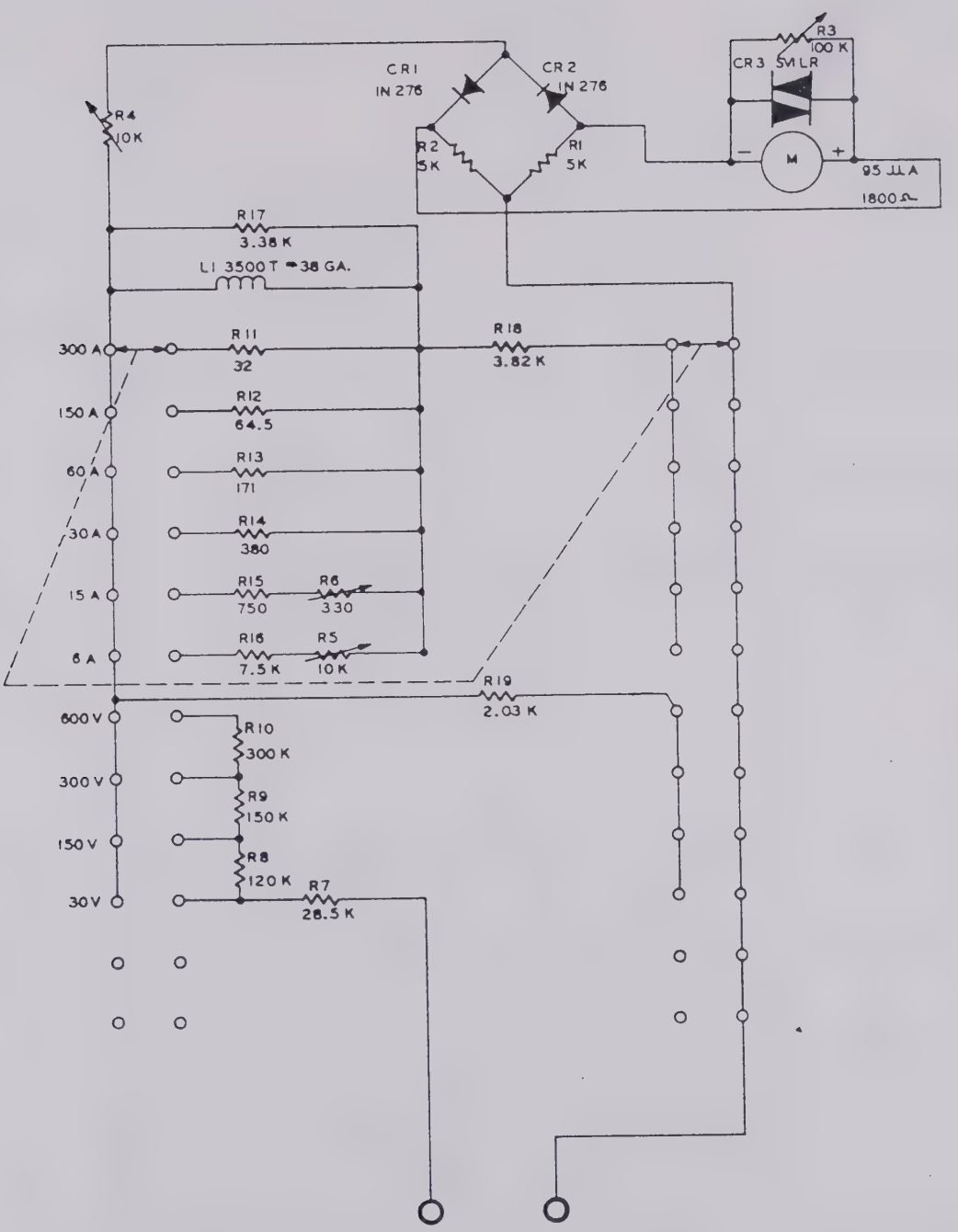

Fig. 5-5 Schematic Diagram, Model 295-2

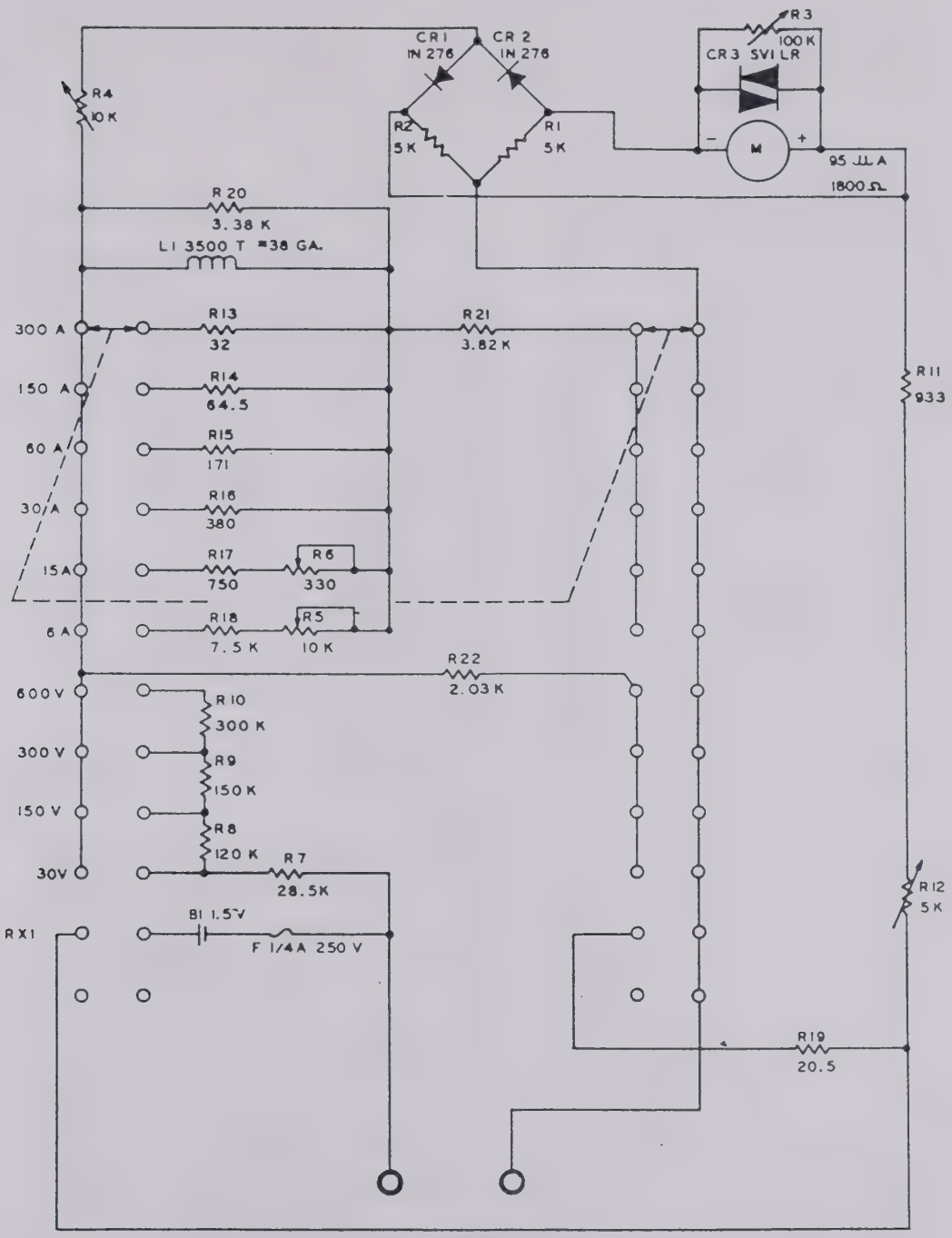

Fig. 5-6 Schematic Diagram, Model 296-2

SIMPSON ELECTRIC COMPANY
853 DUNDEE AVENUE
ELGIN, ILLINOIS 60120
PHONE 697-2260

ALOG ELECTRICAL PRODUCTS

MODEL 294-2 AMP CLAMP 1980-

PART NUMBER	DESCRIPTION			PRT REF	SPECIAL INFORMATION
	TESTER SECTION PARTS				
10-862902	PC BD ASSEM COMPLETE M-294-2				
05-116677	RES 5K	1/4W	1.0%	R1	
05-116677	RES 5K	1/4W	1.0%	R2	
05-116664	POT 10CK		20%	R3	
05-116663	POT 1CK		20%	R5	
05-116662	POT 330.0 OHM		20%	R6	
05-116809	RES 32.0 OHM	1/2W	1.0%	R7	
05-116669	RES 64.5 OHM	1/2W	1.0%	R8	
05-116670	RES 171.0 OHM	1/2W	1.0%	R9	
05-116671	RES 380.0 OHM	1/2W	1.0%	R10	
05-116672	RES 750.0 OHM	1/2W	1.0%	R11	
05-116678	RES 7.5K	1/2W	1.0%	R12	
05-116675	RES 3.38K	1/4W	1.0%	R13	
01-115970	DIODE 1N100 GERMANIUM			CR1	
-115970	DIODE 1N100 GERMANIUM			CR2	
01-110670	DIODE SV1-LR-V64 OVRLOAD PROT.			CR3	
05-116692	SWITCH				
	HOUSING ASSEM TOP & BOTTOM				
10-864329	HOUSING ASSEM BOTTOM W/JAWS				
10-864208	HOUSING ASSEM BOTTOM				
06-182093	SPRING, TORSION				
06-112053	COIL, PICK UP			L1	
10-864171	CORE ASSEM RIGHT				
10-864169	CORE ASSEM LEFT				
06-182115	SCREW 2-56 X 1/2				
05-112052	SCREW 4-40				
06-111555	GASKET, PRESSURE SENSITIVE				
06-111556	COVER BATT & FUSE COMPARTMENT				
06-111557	LABEL WARNING				
06-111568	ACTUATOR, POINTER LOCK				
05-136688	SCREW 3-48 X 7/16				
06-111556	GASKET PRESSURE SENSITIVE				
10-864202	HOUSING ASSEM TOP				
03-260880	ZERO ADJUSTER AMP CLMP SERIES				
06-111565	COVER OHM ADJ.				
06-111191	LABEL ID				

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ANALOG ELECTRICAL PRODUCTS

MODEL 294-2 AMP CLAMP 1980-

PART NUMBER	DESCRIPTION	PRT REF	SPECIAL INFORMATION
06-111564	COVER, TERMINAL		
05-146689	SCREWS 3-48 X 7/8		
06-111176	LABEL, CAUTION		
03-260591	KNOB RANGE SLECTOR M294		
05-116814	PLATE, SELECTOR KNOB		
05-112656	BEARING STRAP		
05-112657	FASTENENER, SELF LOCKING		
	REPLACEMENT METER		
15-313825	REPL METER L/DIAL M294/295/296		
10-293668	ARMATURE W/SPG 13-10		
03-812127	DIAL PRINTED M-294		
00-006399	BUMPER FOOT		
01-321153	SCREW 6-8C X .145 DIAL MTG		
03-223371	LOCKWASHER		
06-111126	OPER MANUAL M294-2/295-2/296-2		

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ALCO ELECTRICAL PRODUCTS

MODEL 295-2 AMP CLAMP 1980 PARTS LIST

PART NUMBER	DESCRIPTION		PRT REF	SPECIAL INFORMATION
	TESTER SECTION PARTS			
10-862903	PC BD ASSEM COMPLETE M295-2			
05-116677	RES 5K	1/4W 1.0%	R1	
05-116677	RES 5K	1/4W 1.0%	R2	
05-116664	POT 10CK	20%	R3	
05-116663	POT 1CK	20%	R4	
05-116663	POT 1CK	20%	R5	
05-116662	POT 330.0 OHM	20%	R6	
05-116679	RES 28.5K	1/4W 1.0%	R7	
05-116680	RES 12CK	1/2W 1.0%	R8	
01-117895	RES 15CK	1/2W 1.0%	R9	
05-116803	RES 30CK	1/2W 1.0%	R10	
05-116809	RES 32.0 OHM	1/2W 1.0%	R11	
05-116669	RES 64.5 OHM	1/2W 1.0%	R12	
05-116670	RES 171.0 OHM	1/2W 1.0%	R13	
-116671	RES 380.0 OHM	1/2W 1.0%	R14	
5-116672	RES 750.0 OHM	1/2W 1.0%	R15	
05-116678	RES 7.5K	1/2W 1.0%	R16	
05-116675	RES 3.38K	1/4W 1.0%	R17	
05-116676	RES 3.82K	1/4W 1.0%	R18	
05-116674	RES 2.03K	1/4W 1.0%	R19	
01-115970	DIODE IN100 GERMANIUM		CR1	
01-115970	DIODE IN100 GERMANIUM		CR2	
01-110670	DIODE SV1-LR-V64 OVRLOAD PROT.		CR3	
10-862899	SWITCH ASSEM			
	HOUSING ASSEM TOP & BOTTOM			
10-864329	HOUSING ASSEM BOTTOM W/JAWS			
10-864208	HOUSING ASSEM BOTTOM			
06-182093	SPRING TORSION			
06-112053	COIL, PICK UP		L1	
10-864171	CORE ASSEM RIGHT SIDE			
10-864169	CORE ASSEM LEFT SIDE			
06-182115	SCREW 2-56 X 1/2			
05-112052	SCREW 4-40			
06-111555	GASKET, PRESSURE SENSITIVE			
06-111566	COVER BATT & FUSE COMPARTMENT			
06-111557	LABEL WARNING			

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ANALOG ELECTRICAL PRODUCTS

MODEL 296-2 AMP-CLAMP 198C

PART NUMBER	DESCRIPTION	PRT REF	SPECIAL INFORMATION
06-111555	GASKET, PRESSURE SENSITIVE		
06-111569	LABEL WARNING		
03-320445	COVER PLATE M296		
06-111568	ACTUATOR, POINTER LOCK		
05-136688	SCREW 3-48 X 7/16		
06-111556	GASKET PRESSURE SENSITIVE		
10-864204	HOUSING ASSEM TOP		
03-260880	ZERO ADJUSTER AMP CLMP SERIES		
06-111193	LABEL ID		
05-146689	SCREW 3-48 X 7/8		
10-560242	COVER ASSEMBLY		
05-113997	FUSE 1/4 AMP	F1	
06-111176	LABEL, CAUTION		
03-260640	KNOB WHEEL TYPE-HAND HELD		
05-116816	PLATE, SELECTOR KNOB		
05-112657	FASTENER, SELF LOCKING		
03-812001	TERMINAL FORMED		
05-118871	SPRING CONTACT .225 LG. ARM		
05-118872	SPRING CONTACT .300 LG. ARM		
	REPLACEMENT METER		
15-313825	REPL MOVT L/DIAL M294/295/296		
10-293668	ARMATURE W/SPG 13-1C		
03-812129	DIAL PRINTED M-295		
00-006399	BUMPER FOOT		
01-321153	SCREW C-8C X .145 DIAL MTG		
03-223371	LOCKWASHER		
06-111126	OPER MANUAL M294-2/295-2/296-2		
00041	*TEST LEADS		

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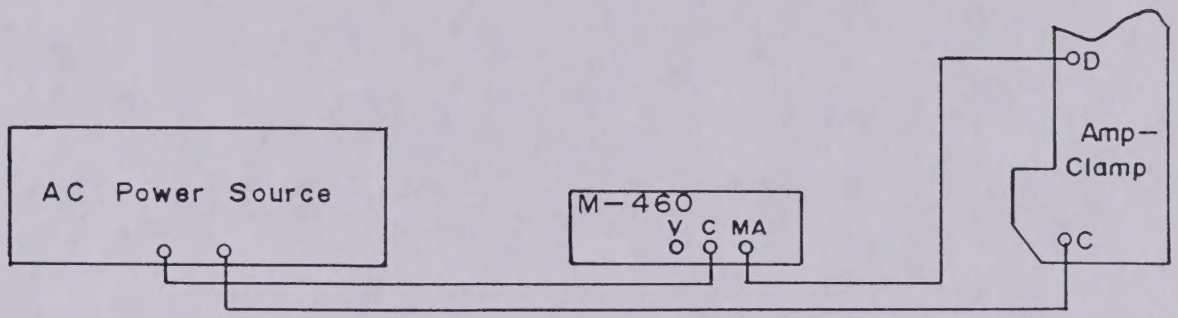


Figure 4 – 1. Meter Calibration

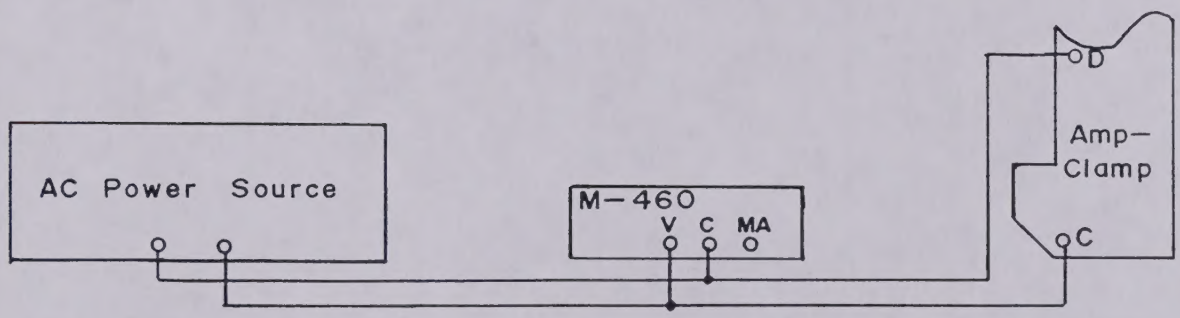


Figure 4 – 2. Voltage Test Setup

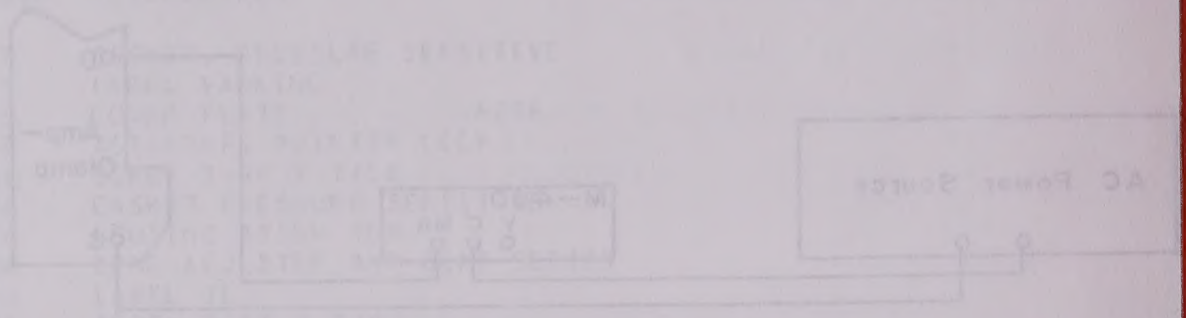


Figure 4 – 1. Meter Calibration

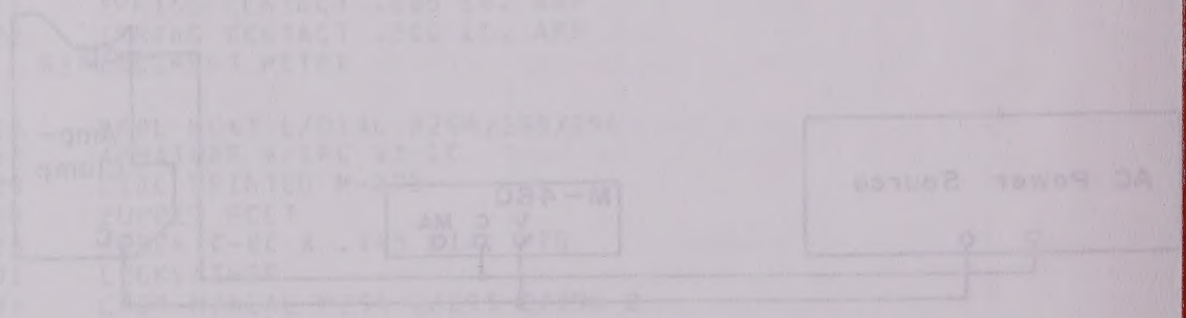
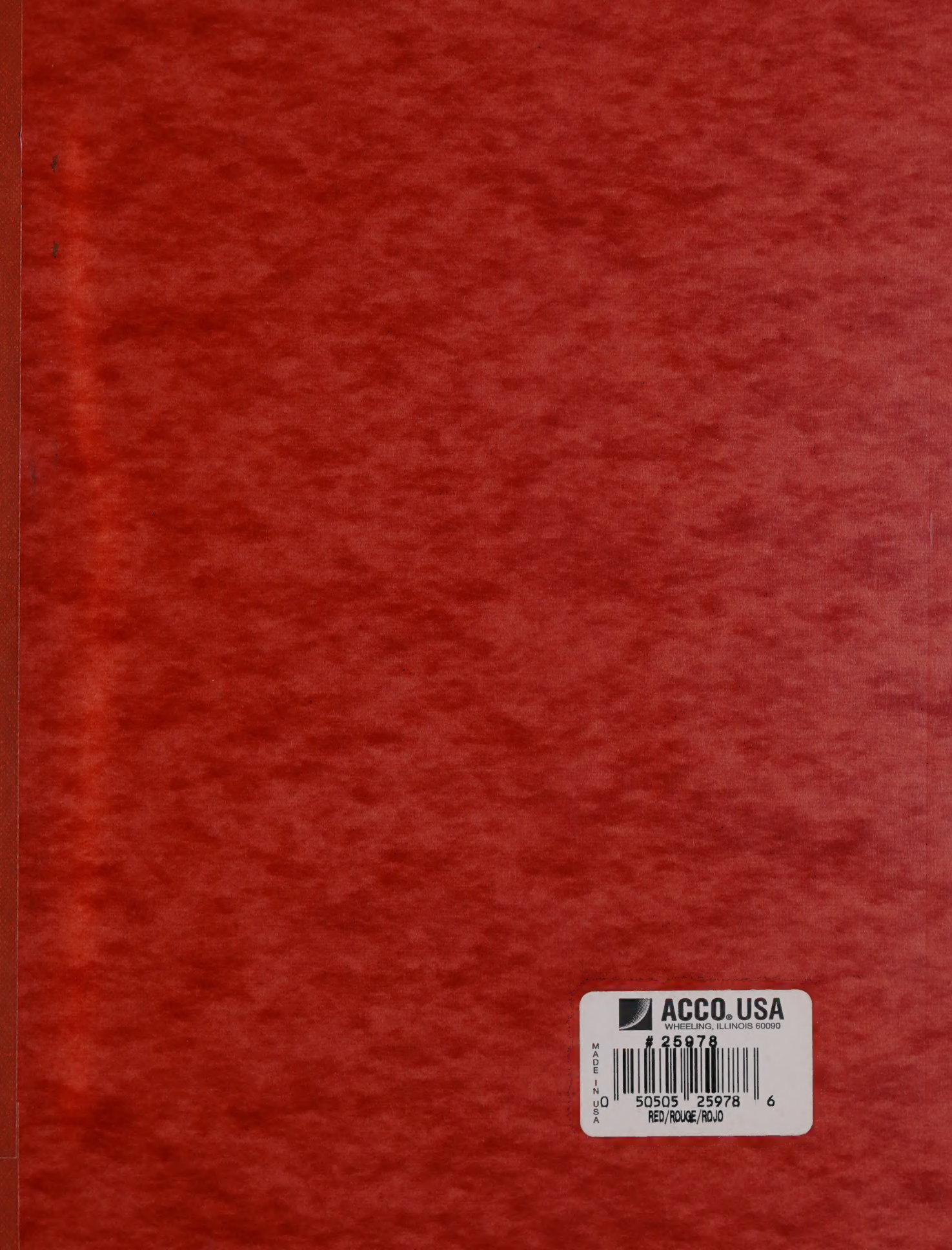


Figure 4 – 2. Voltage Test Setup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